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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/796,563	GIANNAKIS ET AL.	
	Examiner	Art Unit	
	Juan A. Torres	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/27/2004 and 03/24/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The information disclosure statements (IDSs) submitted on 09/27/2004 and 03/24/2005 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Regarding information disclosure statement (IDS) submitted on 09/27/2004, reference numbers 21 and 43 (see left column) have been modified with what seems to be the appropriate date of publication; and reference 31 has been deleted because it is identical to reference 3.

Regarding information disclosure statement (IDS) submitted on 03/24/2005, reference number 65 (see left column) has been modified with what seems to be the appropriate date of publication; and reference number 82 has not been considered because doesn't include a date.

Drawings

The drawings are objected to because:

a) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "8" has been used to designate both overall channel (see figure 3) and channel (see figure 3); reference character "40" has been used to designate both rake receiver (see figure 3) and one receive antenna (see paragraph [0037] in page 10);

b) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s)

mentioned in the description: "18" (see paragraph [0028] in page 6, and paragraph [0029] in page 7); "36" (paragraph [0039] page 11);

c) The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "20" and "40" have both been used to designate rake receiver; reference characters "22" and "42" have both been used to designate MCR unit; reference characters "24" and "44" have both been used to designate symbol detector; and

d) Reference character "6" is used twice in figure 2; it is suggested to delete one of the reference characters.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

a) The recitation "$\varepsilon \square \sigma^2$" in paragraph [0035] page 10 between equations (12) and (13) is improper; it is suggested to change the square character by the appropriate character (that seems to be ≥).

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti ("A simple transmit diversity technique for wireless Communications", IEEE Journal on Selected Areas in Communications, Volume 16, Issue 8, Oct. 1998 Page(s): 1451 – 1458) in view of Richards (US 6556621 B1).

Regarding claim 1, Alamouti discloses processing a stream of information-bearing symbols to form a plurality of symbol blocks, where each symbol block comprises one or more of the information bearing symbols (figure 2 section 3 pages 1453-1455); generating multiple waveforms from the symbol blocks,

where each of the waveforms convey the symbols of their respective symbol blocks as pulses repeated over a plurality of frames (figure 2 section 3 pages 1453-1455, s_0 and s_1); and transmitting the waveforms over different antennas as a space-time coded communication (figure 2 section 3 pages 1453-1455). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms and that the communication is a ultra-wideband (UWB) communication. Richards discloses ultra-wideband (UWB) waveforms and a UWB communication (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 2, Alamouti and Richards disclose claim 1, Alamouti also discloses duplicating each symbol to form a first symbol block and a second symbol block each comprising the same information bearing symbol (figure 2 section 3 pages 1453-1455, s_0 and s_1); generating a first waveform from the first symbol block and a second waveform from the second symbol block (figure 2 section 3 pages 1453-1455, s_0 and s_1), and simultaneously transmitting the first waveform from a first transmit antenna and the second waveform from a second transmit antenna (figure 2 section 3 pages 1453-1455, tx antenna 0 and tx

antenna 1 s_0 and s_1). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 3, Alamouti and Richards disclose claim 1, Alamouti also discloses parsing the stream of symbols into blocks of symbol pairs (figure 2 section 3 pages 1453-1455, s_0 and s_1); generating a first waveform to transmit the symbol pairs in a first order and a second waveform to transmit the symbol pairs in a second order opposite from the first order (figure 2 section 3 pages 1453-1455, s_0 and s_1); and simultaneously transmitting the first waveform from a first transmit antenna and the second waveform from a second transmit antenna (figure 2 section 3 pages 1453-1455, tx antenna 0 and tx antenna 1 s_0 and s_1). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would

have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 4, Alamouti and Richards disclose claim 1, Alamouti also discloses parsing the stream into a first block of symbols while maintaining an order of the stream of symbols (figure 2 section 3 pages 1453-1455, antenna t0 s_0 and s_1); and permuting the symbols of the first block to form a second block in which the symbols are in an order different from the order of the stream of symbols (figure 2 section 3 pages 1453-1455, antenna t1 s_0 and s_1).

Regarding claim 5, Alamouti and Richards disclose claim 1, Richards also discloses power loading and pulse shaping each of the symbols of the symbol blocks to generate the pulses for transmission repeatedly over the plurality of frames (column 5 lines 1-15). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 6, Alamouti and Richards disclose claim 1, Richards also discloses pulse amplitude modulation (column 6 lines 41-51). Alamouti and

Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 7, Alamouti and Richards disclose claim 1, Richards also discloses pulse position modulation (column 1 lines 36-42; and column 6 lines 52-67). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 8, Alamouti and Richards disclose claim 1, Alamouti also discloses permuting the frames to interleave the frames (figure 2 section 3 pages 1453-1455, s_0 and s_1); and generating multiple waveforms from the interleaved frames (figure 2 section 3 pages 1453-1455, table I). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings

are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 9, Alamouti and Richards disclose claim 1, Alamouti also discloses receiving the transmitted waveforms through a wireless communication channel with a plurality of receive antennas (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455); and performing maximum ratio combining (MRC) on the plurality of frames to produce a stream of estimate symbols (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 10, Alamouti and Richards disclose claim 9, Alamouti also discloses receiving a first waveform of the transmit signals with a receive antenna (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 rx antenna 0); receiving a second waveform of the transmit signals with the receive antenna (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 rx antenna 1), and performing maximum ratio combining (MRC) on the first waveform to yield a first decision statistic (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455); performing MRC on the second waveform to yield a second decision statistic (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455); combining the first and second decision statistics to create a combined decision statistic (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 adder in figure 1 and combiner in figure 3); and outputting an estimate symbol based on the combined decision statistic (figure 1 section II pages 1452-1453; and section III.B pages 1454-1455 s0 in figure 1 and s0 and s1 in figure 3). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce

the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 11, Alamouti and Richards disclose claim 9, Alamouti also discloses separating the received waveforms into even and odd indexed frames at the receive antennas (figure 1 section II pages 1452-1453; and section III.B pages 1454-1455 r0 and r1 in figure 1 and s0 and s1 in figure 3). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 12, Alamouti discloses a space-time (ST) encoder that processes a stream of information-bearing symbols to form a plurality of ST-encoded symbol blocks, where each symbol block comprises one or more of the information bearing symbols (figure 2 section III pages 1453-1455); generating multiple waveforms from the symbol blocks, where each of the waveforms convey the symbols of their respective symbol blocks as pulses repeated over a plurality of frames (figure 2 section 3 pages 1453-1455, s_0 and s_1); and a plurality

of antennas that transmit the UWB waveforms over a wireless communication channel (figure 2 section 3 pages 1453-1455). Alamouti doesn't specifically disclose pulse shapers that generate multiple ultra-wideband (UWB) waveforms. Richards discloses pulse shapers that generate multiple ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 13, Alamouti and Richards disclose claim 12, Alamouti also discloses that the ST encoder duplicates each symbol to form a first symbol block and a second symbol block each comprising the same information bearing symbol, and the plurality of pulse generators generate a first waveform from the first symbol block and a second signal from the second symbol block for simultaneous transmission via the plurality of antennas (figure 2 section 3 pages 1453-1455, tx antenna 0 and tx antenna 1 s_0 and s_1). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless

communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 14, Alamouti and Richards disclose claim 12, Alamouti also discloses that the ST encoder parses the stream of symbols into blocks of symbol pairs (figure 2 section 3 pages 1453-1455, s_0 and s_1); and, for each symbol pair, generates a first symbol block that stores the pair of symbols in a first order and a second symbol block that duplicates the pair of symbols and stores the pair of symbols in a second order opposite from the first order (figure 2 section 3 pages 1453-1455, s_0 and s_1).

Regarding claim 15, Alamouti and Richards disclose claim 12, Alamouti also discloses permuting the symbols of the first block to form a second block in which the symbols are in an order different from the order of the stream of symbols (figure 2 section 3 pages 1453-1455, antenna t1 s_0 and s_1).

Regarding claim 16, Alamouti and Richards disclose claim 12, Richards also discloses modulating the pulses for transmission repeatedly over the frames (column 5 lines 1-15 and column 6 lines 41-67). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system

disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 17, Alamouti and Richards disclose claim 12, Richards also discloses pulse amplitude modulation (column 6 lines 41-51). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 18, Alamouti and Richards disclose claim 12, Richards also discloses pulse position modulation (column 1 lines 36-42; and column 6 lines 52-67). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 19, Alamouti and Richards disclose claim 12, Richards also discloses that the wireless communication device comprises one of a base station and a mobile device (column 8 lines 43-53). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 20, Alamouti discloses a plurality of antennas to receive a plurality of space-time (ST) encoded waveforms through a wireless communication channel (section III.B pages 1454-1455); and a maximum ratio combining (MRC) unit that processes the ST encoded signals and produces a stream of estimate symbols (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455). Alamouti doesn't specifically disclose ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce

the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 21, Alamouti and Richards disclose claim 20, Alamouti also discloses separating the received waveforms into even and odd indexed frames at the receive antennas (figure 1 section II pages 1452-1453; and section III.B pages 1454-1455 r0 and r1 in figure 1 and s0 and s1 in figure 3). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 22, Alamouti and Richards disclose claim 20, Alamouti also discloses a plurality of antennas comprise a first antenna that receives a first waveform (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 rx antenna 0) and a second antenna that receives a second waveform (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 rx antenna 0) and that the MRC unit performs maximum ratio combining (MRC) on the first waveform to yield a first decision statistic (figure 1

section II pages 1452-1453; and figure 3 section III.B pages 1454-1455), performs MRC on the second waveform to yield a second decision statistic (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455), combines the first and second decision statistics to create a combined decision statistic (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455 adder in figure 1 and combiner in figure 3), and outputs one of the estimate symbols based on the combined decision statistic (figure 1 section II pages 1452-1453; and section III.B pages 1454-1455 s0 in figure 1 and s0 and s1 in figure 3). Alamouti doesn't specifically disclose that the waveforms are ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 23, Alamouti and Richards disclose claim 20, Richards also discloses that the wireless communication device comprises one of a base station and a mobile device (column 8 lines 43-53). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious

to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 24, Alamouti discloses a transmitter that outputs a plurality of space-time (ST) encoded waveforms via a plurality transmit antennas (figure 2 section 3 pages 1453-1455); and a receiver that receives the plurality of ST-encoded waveforms via a wireless communication channel, and performs maximum ratio combining (MRC) on the signals to produce estimate symbols (figure 1 section II pages 1452-1453; and figure 3 section III.B pages 1454-1455). Alamouti doesn't specifically disclose ultra-wideband (UWB) waveforms. Richards discloses ultra-wideband (UWB) waveforms (column 1 lines 13-52; column 4 lines 1-67 and column 5 lines 1-54). Alamouti and Richards teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Alamouti the UWB technique disclosed by Richards. The suggestion/motivation for doing so would have been to reduce the interference and the multipath effect of the system (Richards column 7 lines 35-45 and column 8 lines 43-55).

Regarding claim 25, Alamouti and Richards disclose claim 24, Alamouti also discloses that the receiver comprises a plurality of receive antennas (section III.B pages 1454-1455).

Regarding claim 26, Alamouti and Richards disclose claim 24, Alamouti also discloses separating the received waveforms into even and odd indexed frames at the receive antennas (figure 1 section II pages 1452-1453; and section III.B pages 1454-1455 r0 and r1 in figure 1 and s0 and s1 in figure 3).

Claims 1 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tarokh ("Space-time codes for high data rate wireless communication: performance criterion and code construction", IEEE Transactions on Information Theory, Volume 44, Issue 2, March 1998 Page(s): 744 - 765) in view of Kolenchery ("A novel impulse radio network for tactical military wireless communications", Military Communications Conference, 1998, MILCOM 98, Proceedings, IEEE Volume 1, 18-21 Oct. 1998 Page(s): 59 - 65 vol.1).

Regarding claim 1, Tarokh discloses processing a stream of information-bearing symbols to form a plurality of symbol blocks, where each symbol block comprises one or more of the information bearing symbols (abstract and section I.D pages 744, 746-747 figures 1 and 2); generating multiple waveforms from the symbol blocks, where each of the waveforms convey the symbols of their respective symbol blocks as pulses repeated over a plurality of frames (abstract and section I.D pages 744, 746-747 figures 1 and 2); and transmitting the waveforms over different antennas as a space-time coded communication (abstract and section I.D pages 744, 746-747 figures 1 and 2). Tarokh doesn't

specifically disclose that the waveforms are ultra-wideband (UWB) waveforms and that the communication is a ultra-wideband (UWB) communication. Kolenchery discloses ultra-wideband (UWB) waveforms and a UWB communication (abstract and introduction page 59 [this is the first page of the paper]). Tarokh and Kolenchery teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Tarokh the UWB technique disclosed by Kolenchery. The suggestion/motivation for doing so would have been to reduce the power spectral density (interference), to increase the immunity to fading (multipath), and to increase the low probability of detection and interception (LPD and LPI) of the system (Kolenchery abstract and first paragraph of section introduction).

Regarding claim 12, Tarokh discloses a space-time (ST) encoder that processes a stream of information-bearing symbols to form a plurality of ST-encoded symbol blocks, where each symbol block comprises one or more of the information bearing symbols (abstract and section I.D pages 744, 746-747 figures 1 and 2); a plurality of pulse shapers that generate multiple waveforms from the symbol blocks, where each of the waveforms convey the symbols of their respective symbol blocks as pulses repeated over a plurality of frames (abstract and section I.D pages 744, 746-747 figures 1 and 2); and a plurality of antennas that transmit the UWB waveforms over a wireless communication channel (abstract and section I.D pages 744, 746-747 figures 1 and 2). Tarokh

doesn't specifically disclose ultra-wideband (UWB) waveforms. Kolenchery discloses ultra-wideband (UWB) waveforms (abstract and introduction page 59 [this is the first page of the paper]). Tarokh and Kolenchery teachings are analogous art because they are from the same field of endeavor of wireless communications. At the time of the invention it would have been obvious to a person of ordinary skill in the art to incorporate in the communication system disclosed by Tarokh the UWB technique disclosed by Kolenchery. The suggestion/motivation for doing so would have been to reduce the power spectral density (interference), to increase the immunity to fading (multipath), and to increase the low probability of detection and interception (LPD and LPI) of the system (Kolenchery abstract and first paragraph of section introduction).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

a) Richards (US 6925109 B2) discloses fast acquisition of ultra-wideband in a multipath environment; and

b) Kumar ("Application of layered space-time processing to ultrawideband communication", The 2002 45th Midwest Symposium on Circuits and Systems, 2002. MWSCAS-2002. Volume 3, 4-7 Aug. 2002 Page(s): III - 597-600 vol.3) discloses using layered Space-Time processing over UWB systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is 571-272-3119. The examiner can normally be reached on 8-6 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juan Alberto Torres
03-29-2007